Solutions for low temperature heating of rooms and domestic hot water in existing

Svendsen, Svend ; Østergaard, Dorte Skaarup; Yang, Xiaochen

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

Session 11: Low-temperature DH and buildings

Svend Svendsen is professor at the Technical University of Denmark, Department of Civil Engineering and is leader of WP1 in the 4DH Research Centre. Svend Svendsen started working on development of low temperature district heating in 2005 and has initiated a number of research projects and PhD-projects in this area.

Session Keynote:

Solutions for low temperature heating of rooms and domestic hot water in existing buildings

Svend Svendsen[1], Dorte Skaarup Østergaard[2], Xiaochen Yang[21] Corresponding author and presenter, Professor, Technical University of Denmark, Department of Civil Engineering, Brovej, Building 118, DK-2800 Kgs. Lyngby, Denmark. Tel. +45 42 25 18 54, E-mail address: ss@byg.dtu.dk [2]Technical University of Denmark, Department of Civil Engineering, Brovej, Building 118, DK-2800 Kgs. Lyngby, Denmark.*

Keywords: Low temperature heating of buildings, Radiators, Domestic Hot Water. Supply and return temperature, District heating

Implementation of 4th generation district heating systems in areas with existing buildings must be based on lowering the operation temperature of room heating system and the domestic hot water system. With a lower return temperature from the buildings the district heating network and the heat producing plant can work with improved efficiency. With a lower supply temperature to the buildings, the district heating system can use heat sources at lower temperatures, which is very beneficial for use of waste heat and renewable energy. With an equal reduction in return and supply temperature the heat transport capacity of the district heating network remains unchanged and may even be increased in peak load situations by use of higher supply temperatures.

The part on room heating systems in the article is focused on existing buildings with radiators because they represent the major challenge for low temperature operation as other heating systems as floor heating by nature is a low temperature heating system. The supply and return temperatures of room heating systems in existing buildings with radiators depends on the following parameters:

Type of pipe system supplying heat to the radiators – i.e. one or two string system

Type of radiators – i.e. high elements with vertical downwards stratified flow or low elements with horizontal mixed flow

Type of control system – i.e. centrally of heating system and individually on each radiator

Design criteria – i.e. design load and design operation temperatures

Actual heating load of rooms – i.e. realistic heating load of actual partly energy renovated building during the heating season.

Solutions for lowering the return temperature as step 1 and the supply temperature as step 2 have been investigated and are presented in the article.The part on domestic hot water heating systems in the article includes typical systems used in large buildings with a DHW circulation system and small single-family building without DHW circulation system. The required supply temperature and the possible return temperature of the water in the district heating system depends on the following parameters:

Type of DHW production system – i.e. with storage tanks or instantaneous heat exchanger

Type of DHW distribution system – i.e. with or without circulation system

Type of control system

Design and real DHW load

Design and real heat transfer capacity of heat exchanger system and heat loss of distribution system

Solutions for lowering the return temperature as step 1 and the supply temperature as step 2 have been investigated and are presented in the article.